Advanced Microwave Electrothermal Thruster (AMET), Phase I

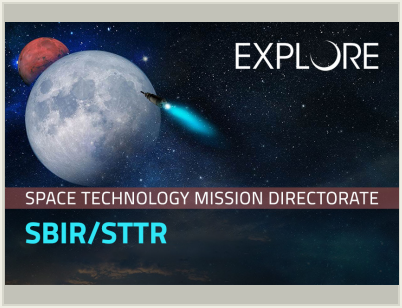
Completed Technology Project (2009 - 2010)

Project Introduction

Orbital Technologies Corporation (ORBITEC) and the University of Alabama at Huntsville (UAH) propose to develop the Advanced Microwave Electrothermal Thruster (AMET), a high-efficiency thruster which will use water propellant to enable various Lunar and Mars missions. The proposed AMET will incorporate a number of innovations to dramatically improve upon existing designs, including the use of a lower microwave frequency (915 MHz) to permit the achievement of very high microwave generation efficiency with commercially-available magnetrons. The AMET is a particularly attractive option for this class of missions because it provides specific impulse (~800 seconds) well beyond the reach of chemical propulsion, it provides high thrust per unit power to keep transit times acceptably short, and it permits the use of an easily-storable propellant (water) which is known to be available on both the Moon and Mars. ORBITEC staff has experience operating microwave electrothermal thrusters with water vapor as propellant. In Phase I, the AMET will be demonstrated with water vapor propellant to demonstrate feasibility, reaching TRL 4. In Phase II, a flight-like AMET will be developed and demonstrated and a design will be prepared for an entire AMET flight propulsion system, reaching TRL 6.

Anticipated Benefits

Potential NASA Commercial Applications: The AMET, and related MET propulsion systems, will also be very attractive for applications in Earth orbit for both DoD and commercial space operations. In one configuration, the AMET may be combined with a chemical rocket engine using hydrogen-oxygen, formed by on-board electrolysis, to form a highly flexible dual-mode propulsion system which can respond to emerging mission requirements with either electric propulsion or chemical propulsion, enabling mission planners to achieve high Isp or high thrust, as needed. Such a system would be attractive for space systems ranging from commercial communications satellites to DoD surveillance spacecraft in need of periodic orbital maneuvering.



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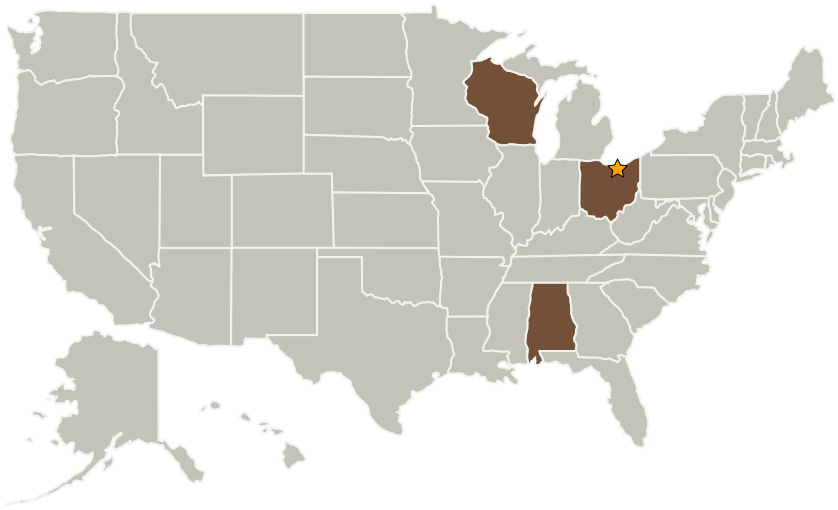
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Orbital Technologies Corporation	Supporting Organization	Industry Women-Owned Small Business (WOSB)	Madison, Wisconsin
University of Alabama in Huntsville(UAH)	Supporting Organization	Academia	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Ohio
Wisconsin	

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

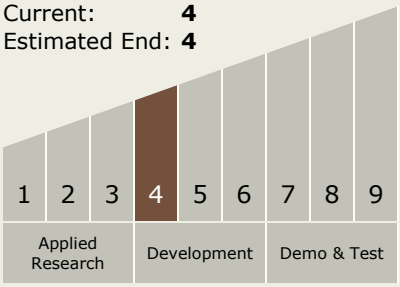
Carlos Torrez

Principal Investigator:

Christopher P Stclair

Technology Maturity (TRL)

Start: **4**
Current: **4**
Estimated End: **4**



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Project Transitions

January 2009: Project Start

January 2010: Closed out

Closeout Summary: Advanced Microwave Electrothermal Thruster (AMET), Phase I Project Image

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.2 Electric Space Propulsion
    - TX01.2.2 Electrostatic